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## Using an Image Discrimination Model to Predict the Detectability of Targets in Color Scenes

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Sensor fusion combines images from multiple sensors into a single display, with the aim of enhancing operators' target detection and situational awareness in high-workload environments. Numerous researchers (Toet & Walraven, 1996; Therrien, Scrofani, & Krebs, 1997; Waxman *et al.*, 1997; Scribner, *et al.*, 1998) have proposed sensor-fusion algorithms that might perform as well as or better than single-band imagery, however human performance studies have not shown consistent benefits for fused multi-band over single-band imagery (Krebs & Sinai, in press). **Objective:** The goal of our research is to develop an image discrimination model that can predict the detectability of targets in color scenes. This model would need to be a fairly robust and accurate predictor of the detectability of a target in a sensor-fused scene to obviate the need of performing human performance studies. **Methods:** Images were collected with visible, mid-wave, and long-wave infrared sensors and then combined by an image fusion algorithm. Observers' reaction times and accuracy scores were collected in a variety of visual search tasks using single and dual-band imagery. Similar scenes were used as maskers of simple luminance and chrominance targets. **Results:** Visual search results found that sensor fusion did not improve performance relative to that obtained with single-band imagery on a target detection task. Moreover, these experiments demonstrate significant masking of color targets by color variations in the background texture. An image discrimination model was developed to predict the effects of masking of luminance and chromatic targets by color variations in the background scene. **Conclusions:** Actual or potential applications of this research include a quantitative methodology to evaluate the performance of an image-fused algorithm for automobile, aviation, and maritime applications.

**Keywords:** color vision, target detection, image discrimination, vision models, visual masking

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